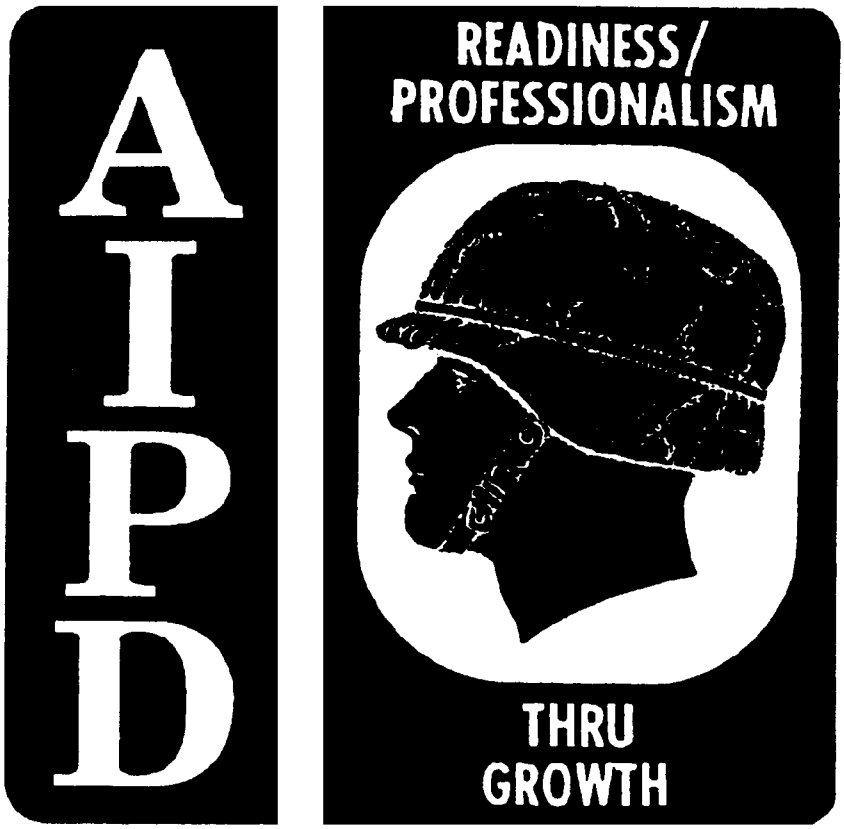
SUBCOURSE
MM0651

EDITION
A

SHOP PRACTICES AND SAFETY



THE ARMY INSTITUTE FOR PROFESSIONAL DEVELOPMENT

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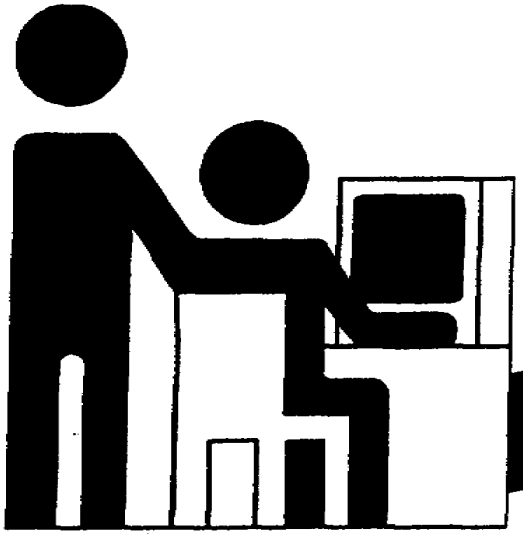

Notice to Students

Use the Ordnance Training Division website,
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to submit your questions, comments, and suggestions
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If you have access to a computer with Internet capability and can receive e-mail, we recommend that you use this means to communicate with our subject matter experts Even if you're not able to receive e-mail, we encourage you to submit content inquiries electronically Simply include a commercial or DSN phone number and/or address on the form provided. Also, be sure to check the Frequently Asked Questions file at the site before posting your inquiry

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THE PASSING SCORE FOR ALL ACCP MATERIAL IS NOW 70%.

PLEASE DISREGARD ALL REFERENCES TO THE 75% REQUIREMENT.

SUBCOURSE 651, SHOP PRACTICES AND SAFETY

INTRODUCTION

It is normal to want to succeed. As a repairman, mechanic, or technician, you want to be successful. And many other people want you to be successful. Your happiness and their happiness depend upon your success. Your boss, your friends, your buddies, and, in fact, your country, are counting on you to do your job well. To do your job well and to be successful will take effort on your part. Serious study and hard work will give you confidence and competence as you acquire knowledge and develop skills related to your military occupational specialty (MOS).

It is normal to want to live. As a member of the human race, the health and well-being of yourself and others concern you. Health and success relate very closely. Your value as a maintenance man depends upon your being on the job regularly and performing productively.

The intent of this subcourse is to present four main topics vital to your success and well being: shop practices, tools, safety, and first aid.

This subcourse consists of one lesson and an examination.

Credit hours: 3

You are urged to finish this subcourse without delay; however, there is no specific limitation as to the time you may spend on it.

Text and Materials Furnished:

Subcourse booklet, Examination, and Answer Sheet

You may keep this booklet,

PLEASE NOTE

Proponency for this subcourse has changed from Signal (SS) to Missile & Munitions (MM).

REVIEWED AND REPRINTED WITH MINOR REVISIONS AUG 76

LESSON

SHOP PRACTICES AND SAFETY

SCOPE	Organization, layout, and operation of an efficient maintenance shop; identification and care of tools; accident prevention; first aid for shock, burns, and bleeding.
CREDIT HOURS	2
TEXT ASSIGNMENT	Attached Memorandum, para 1-13
MATERIALS REQUIRED	None
SUGGESTIONS	None

LESSON OBJECTIVES

When you have completed this lesson, you should:

1. Recognize the importance of each individual in the safe operation of a repair shop.
2. Be able to perform your work more easily, faster, and better.
3. Be able to identify the tools commonly used in electronic equipment repair.
4. Be able to properly care for tools and know why this care is needed.
5. Know what safety means and how you can prevent accidents.
6. Be able to apply artificial respiration or mouth-to-mouth rescue breathing.
7. Be able to apply first aid to victims suffering from burns.
8. Be able to control and stop external bleeding, and to treat superficial lacerations and wounds.

ATTACHED MEMORANDUM

(This publication is provided for nonresident instruction conducted by the US Army Signal Center and School. It reflects the current thought of this school and conforms to published Department of the Army doctrine as closely as possible.)

Section I. THE SHOP

1. MISSION: MAINTENANCE OF EQUIPMENT

The purpose of maintenance has not changed since warfare began. It is to keep the equipment in the hands of military forces operable, and thereby maintain the forces themselves in a combat-ready condition. The importance of maintenance, however, has increased enormously and will continue to increase at an accelerating rate as more and more new items of communications-electronics equipment and weapons systems go into the field. The Army realizes that field use of equipment causes equipment to break down, wear out, and be damaged. And whenever that happens, a maintenance shop is called upon to fix the equipment if it can. If the equipment can be repaired by a local shop, usually the necessary repair work will be done and the equipment will be returned to its user. Thus, the shop performs a service--maintenance--for its customers. Maintenance is a service that includes anything that is done to keep equipment serviceable, and anything that is done to restore equipment to serviceable condition if it has become unserviceable. It includes repair, overhaul, servicing, inspection, testing, modification, cannibalization, and disposal. Maintenance is one of the primary functions of logistics. The maintenance shop is a logistical activity whose essential mission is to maintain equipment. As a repairman or mechanic, you will be assigned to a maintenance shop of some type. The shop to which you are assigned may confine its work to equipment that belongs only to your unit, and its mission would be termed organizational maintenance. Or you may be assigned to a shop that does work for a number of using units or for all using units located within a particular geographic area, in which case your shop's mission would be known as direct support maintenance and the shop would return the repaired items of equipment to the using units. Often the organizational maintenance shops and the direct support maintenance shops are mobile shops using shelters mounted on trucks and sometimes using tents or other temporary structures. Or, instead, your assignment may be to a shop that is pretty much permanent as to its location. Such a shop would be a shop whose mission is that of either general support maintenance or depot maintenance. Usually, in general support and depot shops, items that have been repaired will be returned to a supply storage facility where they will be available for issue through supply channels. In any event, with your MOS pertaining to some type of equipment, you can expect to be assigned to an activity or unit whose mission is to perform equipment maintenance.

2. TEAMWORK TO ACCOMPLISH THE MISSION

a. As a member of the shop organization, you have a significant part in accomplishing the workload imposed upon the shop. The shop is not a one-man show. Instead, it is a workplace where the work gets done as a team effort. Each member of the shop, like the member of any team, is expected to carry his share of the total effort or workload. The shop is organized so as to distribute its total workload among its various elements or members. Ordinarily an officer or a noncommissioned officer is in charge of the shop. Your immediate supervisor may be a commissioned officer, a warrant officer, a noncommissioned officer, a senior specialist, or even an Army civilian employee, depending upon the nature of the shop organization and the particular position you occupy in the shop. At any rate, your immediate supervisor

normally will be responsible for assigning tasks for you to do. Each task boils down to this: your having to do some kind of maintenance work on a specified item of equipment. The paperwork that specifies the task is commonly called a work order or a job order. The repairman really has the most critical, most important, most direct role in carrying out every job order or work order. His skills in troubleshooting and in making necessary repairs, adjustments, modifications, and so forth, are what we count on to keep equipment operational.

b. Maintenance is a team effort that goes beyond the equipment repairman. In fact, the repairman needs a lot of assistance and support to be able to do his work effectively. For instance, he needs tools, test equipment, parts, and other supplies; he should have, if possible, a reasonably comfortable place in which to work, such as a building that affords shelter, heat, light, and electrical power. Lack of necessary tools and test equipment can keep even the best of repairmen from getting the required work done. It is pretty difficult to work on equipment if fingers are freezing and you are trying to work in darkness. The Army supply system and its people have to provide the repairman with the tools, test equipment, and parts he needs. A good commander assures that adequate shop facilities are provided so long as circumstances allow. He gives attention to the people and things that are essential to effective maintenance.

c. Let's now itemize and briefly discuss the essentials for effective maintenance.

(1) Tools and test equipment. The tools you need will be issued to you by the supply element of your unit or shop. Usually a whole kit or set of tools will be issued, complete with tool box, appropriate to your MOS. Usually you will keep the tool set as long as you are assigned to a given unit or shop. As you need additional tools and test instruments, you may borrow them from your unit or shop supply element.

(2) Repair parts and other maintenance supplies. The supply clerk or parts specialist in your unit or shop supply element will issue these items to you as you need them in connection with carrying out the various work orders or other properly authorized maintenance work.

(3) Publications. Technical manuals, lubrication orders, modification work orders, technical bulletins, and other publications you need must be available to you. Most units and shops have an individual responsible for keeping the library up to date and for assuring that the publications you need are available to you and the other maintenance personnel in the organization.

(4) Personnel. It takes people to make an Army function and carry out its mission. And the same thing holds true for a maintenance unit or a maintenance shop. It takes manpower to prepare publications, to buy and supply tools and parts, and, of course, to care for the Army's equipment. As a repairman, you'll have to get along not only with your immediate supervisor, but also with equipment users who are the shop's "customers," with the supply people who are in your

shop or who provide supply support to your shop, and with the other repairmen in your shop. Whenever you need help from others, speak up and let them know. You can't do maintenance by yourself. It's done by teamwork.

(5) Time. It takes time to learn to be a good repairman; it takes time to do any repair job properly. If the supply people or the publications people don't have on hand whatever you need, it takes time for them to fill your needs. Even with good individuals in a newly formed maintenance unit or shop, it takes time to get all members working together as a team. But teamwork gets the organization's mission--which is MAINTENANCE--accomplished.

3. LAYOUT FOR PRODUCTION

a. Introduction. You can get your job done easier, faster, and better if you apply some forethought to layout and arrangement of your workplace. You can be your own '"efficiency expert" by applying principles and techniques of work simplification and shop layout, which are discussed in b through f below.

b. Tools. In setting up your workbench or workplace, arrange tools and instruments so that you know where they are and can get your hands on them quickly, with minimum motion. For a while, keep a check or tally on how often you use each tool or instrument. Those which you use or need most frequently in your work are the ones that you should keep, if possible, within elbow or arm length's reach. Once you have determined the frequency of usage for your tools, then you should decide on a definite location or spot for each. Tools that have been issued to you, but that you don't need so often, can be placed or stored conveniently inside the workbench or elsewhere in the shop area, such as in a lockable locker, a tool crib, or other safe place. But those items that you use practically every day should be as easy to find and get as is your wallet or pack of cigarettes. Besides positioning your tools 'according to frequency of usage, you should also consider their being arranged according to sequence or order of usage, especially if a given operation is to be done repetitively or on a production-line basis. Doing so will help to assure complete, correct procedure more or less automatically or habitually. A definite place for all tools, with their positions according to frequency and sequence of use, will keep you from fumbling around for them, will save time, and will aid you in performing your job more efficiently and more in the manner of a craftsman.

c. Parts. Repair parts and expendable shop supplies or materials should also be prepositioned for the convenience of the repairmen. Some parts and supplies, especially the very common) most frequently consumed ones, should be readily available and without delay to the repairman. Solder, friction tape, plastic tubing or insulating sleeves, terminal lugs, nuts and bolts, and other maintenance supplies should be placed for the convenience of all the repairmen working in the shop. Some shops have self-service bins a few steps from each repairman's workbench.

d. Workpiece. This term refers to the item of equipment undergoing repair or servicing. You, as the mechanic or repairman, should position the workpiece so you can work on it as comfortably and conveniently as possible. Jigs, fixtures, cradles, and a number of other type devices are useful for positioning communications-electronics equipment, especially the heavier items. When

the repairman, mechanic, or technician has to strain, stoop, or stretch habitually in doing his work, the chances are that some device is needed to aid him in positioning or holding the equipment while he works on it. Having to work awkwardly or uncomfortably reduces effectiveness and efficiency of the repairman, and may even cause him to suffer medical problems, such as strains, backaches, sprains and so forth. So, remember to position the equipment so you can work on it in reasonable comfort. If you don't have enough hands for a particular repair operation you're doing, maybe a clamp or two can help to hold the workpiece, a tool, or a part in the desired position. If you have to lift an item that's heavy, don't hesitate to ask for and get help. Before you begin a task, make sure you have the workpiece set up properly for the sake of your comfort, convenience, and safety. Consider the height of your workpiece and your chair; do they make for comfort? You should seldom have to hold a workpiece in your hands while working on it; both hands should usually be free for manipulating tools and parts in relation to the workpiece or equipment.

e. Environmental Factors of Lighting, Heating, and Ventilation.

(1) Lighting. If you can't see well enough because of poor lighting, you probably won't be able to find the trouble in the equipment you're working on. Or if you do happen to find the trouble, the necessary repairs may require more light to see what you're doing. Lighting for the Army's maintenance shops usually will be comparable to what is more or less standard in industry. Too much light and glare can be as detrimental as not enough light. You should contact your immediate supervisor if you are not satisfied with lighting conditions at your work site.

(2) Heat. In a maintenance shop, the temperature should be high enough for working without gloves and outer garments that hamper freedom of bodily movements. However, too much heat can be oppressive and cause drowsiness. Individuals seldom agree as to what one ideal temperature should be. Relative humidity affects individual opinion also as to what the ideal temperature should be. Under adverse conditions in the field, just having fingers warm enough in order to work may very well constitute "adequate" heat. A temperature of 70 degrees Fahrenheit is about ideal when relative humidity is around 60 to 70 percent. Direct sunlight should be kept from equipment being repaired, and also from tools and test equipment, because the sunlight in summer can make all these items too hot to touch.

(3) Ventilation. Closely associated with temperature and humidity as they affect human comfort is the movement of air. For instance, even in high heat and high humidity, if the air is moving enough, you may not experience too much discomfort. In a shop, it is also very important to have adequate ventilation, allowing plenty of fresh air. Exhaust fans or other means should be capable of removing harmful fumes created by paint spraying and the running of gasoline or diesel engines in the shop area. Never run a gasoline engine inside a building without venting the exhaust, because carbon monoxide from the engine can accumulate sufficiently to kill you. When using cleaning fluids or solvents, always make sure you have plenty

of ventilation, because prolonged breathing of fumes from these substances may be harmful as well as obnoxious. Overheated selenium rectifiers may give off toxic fumes. Stoves, heaters, furnaces, or forges that burn any kind of fuel--gasoline, oil, wood, coal, charcoal, or any other combustible material--should be vented to prevent asphyxiation. Fumes generated by the charging of storage batteries also require venting, because they can be both annoying and harmful.

f. Keeping the Working Site Orderly. Although your workbench area or site of work will necessarily get messed up somewhat while working on the various jobs, you must continually try to keep your workplace neat, clean, and orderly. A place that is kept that way will be generally healthful, safe, and productive. Good "housekeeping' not only benefits you and your fellow repairmen by creating a good atmosphere, but is also tends to convey to the shop's visitors the notion that you and your shopmates take pride in doing work of high quality. In some shops the standard practice is to set aside a certain amount of time, usually the last 15 to 30 minutes of the working day, to clean up all work areas, put away tools and other items, and make sure the building or area is secure as necessary. Such a period also gives time to perform preventive maintenance on shop machines, tools, test instruments, and other property that belongs to the shop and its members.

Section II. TOOLS

4. TOOLS AND THEIR USE

A mark of proficiency as repairman or technician is your knowledge of the tools associated with your specialty. You must know the names of your tools and when, why, where, and how to use each one. Most of the tools you'll need as a repairman will come in a tool kit the shop or unit supply will issue to you. Other tools, test instruments, and similar items will usually be loaned to you by the toolroom or supply room as you need them.

a. Tool Kits. The specific tool kit you get will depend upon what your shop or unit has on hand or can get. Most likely you will receive a TK-105/G, or a TK-100/G, or a TK-101/G. Any one of those tool kits contains most of the tools needed by the repairman of radio, radar, and similar electronic equipment.

b. Purpose and Application of Tools. Most of the tools in a given tool kit are used to fasten and unfasten something. For instance, all screwdrivers and wrenches are devices that tighten or untighten something by a twisting moving of the tool by hand; soldering irons and soldering guns to solder or unsolder connections and parts. Cutters unfasten wire and sheet metal by their shearing actions. The pliers, the screwdrivers, and the soldering implements tend to be the most often needed and therefore the most frequently used tools in any kit. But many other tools are also necessary from time to time.

5. TOOL RECOGNITION AND CAPABILITIES

a. Pliers. They are classified according to their length and the shape of their jaws.

(1) Slip-joint pliers (fig. 1). The slip-joint arrangement lets you open the jaws of such pliers wide enough to grasp a wide assortment of objects. That's why this type is so often found around the home.

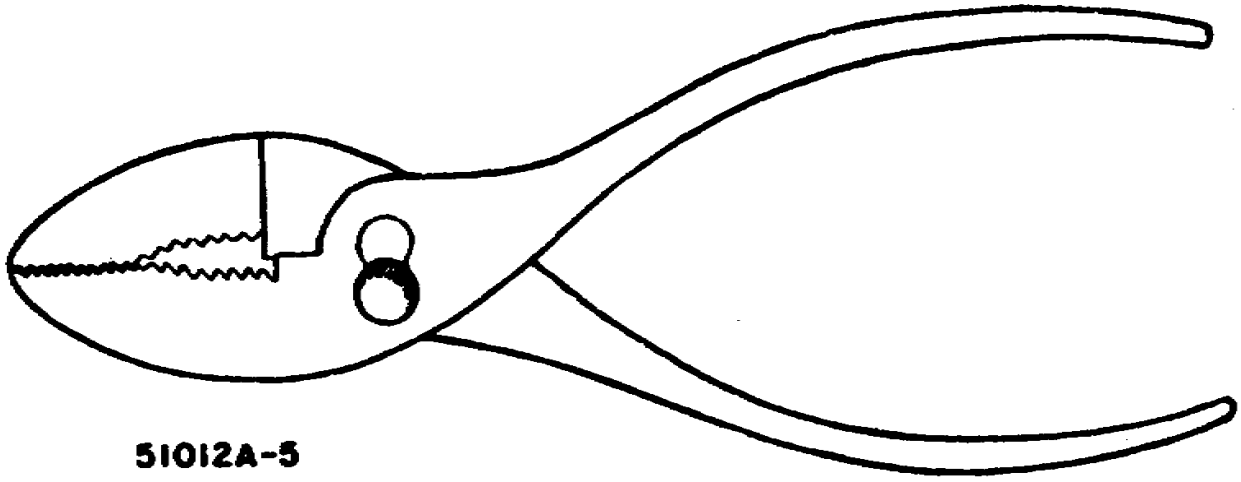

Figure 1. Slip-joint pliers.

(2) Side cutting pliers (fig. 2). A tool of many uses, it is one that you can use to grip things, cut wires, and strip insulation. The roughed-up gripping surface will hold a small object firmly. With this tool, you can cut most kinds of wire as thick as a coat hanger wire. The heel, on the handle side of the pivot, can be used for gently crushing insulation on small-diameter wire. Then the crushed insulation can be removed by pulling the wire through one of the holes on the jaw or cutter side.

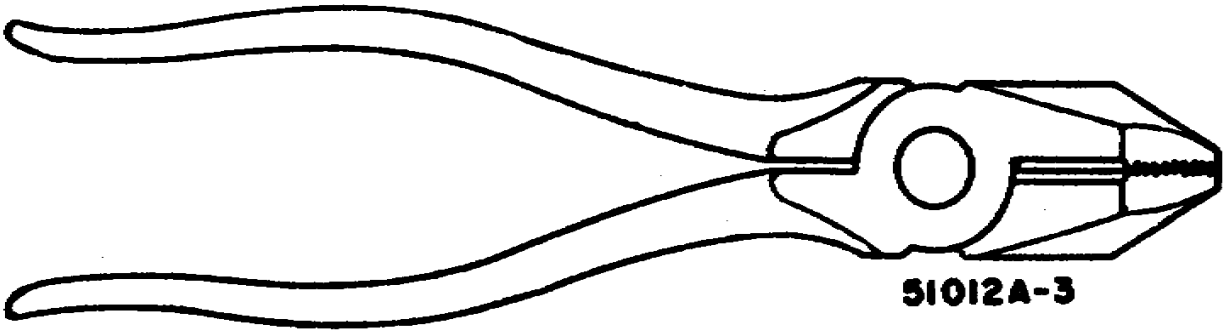

Figure 2. Side cutting pliers.

(3) Longnose pliers (fig. 3). Also called needle nose pliers, this tool can be used to bend loops, to attach wires to terminals, to grip small-diameter wire and other objects in hard-to-get-at places, and to aid in a variety of fairly delicate manipulations. In some models of this tool, the jaw includes diagonal cutting edges near the pivot. Most models have jaws with teeth; others may have smooth jaws, without teeth. With rubber bands stretched tautly across the handles, the longnose pliers will serve additionally as either a light-duty clamp or a heatsink when soldering. There are variations of needle-nose pliers, some of which you'll see in Tool Kit TK-105/G.

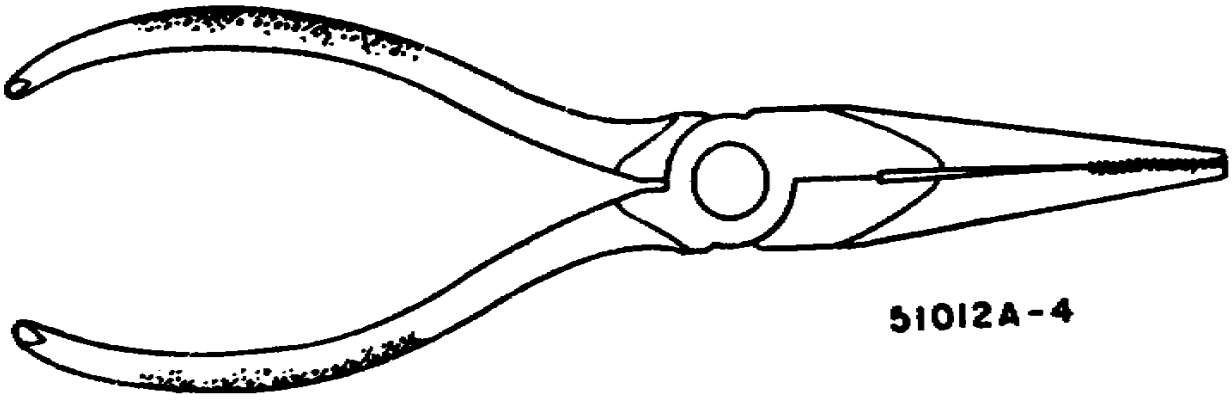

Figure 3. Longnose pliers.

(4) Pliers in a TK-105/G. Figure 4 shows the various pliers that come in a Tool Kit TK-105/G. Items A and B are diagonal cutting pliers. Used for cutting small gauge wires, these are commonly referred to as "diagonal cutters," "diagonals," or "dikes." Diagonal cutting pliers are made in several sizes for electronic work, and range in sizes from the 8-inch length to the 4-inch length. Items C and D are round needle-nose pliers with wire cutters. Item E is a 4-inch round chain-nose or short-nose pliers without cutter. Item F is a curved, round needle-nose pliers with wire cutter; the one illustrated has plastic-coated handles. Item G is a small, slip-joint pliers commonly referred to as ignition pliers; this tool came in the box of sockets shown in figure 7.

b. Screwdrivers. Probably the most used (and abused) tools, screwdrivers are designed to do what their basic, common name implies: to drive screws. The part you grip is called the handle. The steel part that fits into the handle is the shank. The end which fits into the screw slot is the blade. Always use a screwdriver whose blade precisely fits the slot. You'll be able to turn the screw easier, and you'll decrease the chances of having the screwdriver bit jump out of the slot and cause damage. Screwdrivers are made in many different shapes and sizes. Some are short and stubby, some long; some with round shanks, some with square shanks; some with handles of plastic, wood, or metal. Some screwdrivers have blades with the typical flat tip to fit slotted screws and bolts; some have blades with cross tins such as the Phillips' point style. Most have round shanks, but some have square shanks

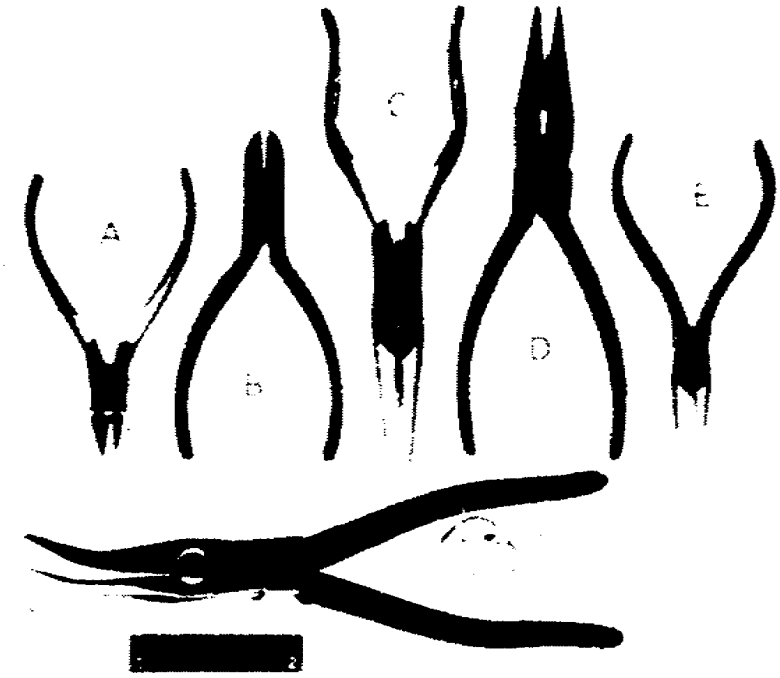

Figure 4. Pliers in a TK-105/G.

so a wrench can be used to give greater leverage to the screwdriver. Some have blades with specialized tips. For instance, some tips have a square cross section, some a flattened "8" or butterfly-shaped cross section, some a hexagonal cross section, some a square cross section, and some a nearly oval-shaped cross section. Some screwdrivers lack the usual wooden or plastic handle, and are offset so as to allow working in a narrow space and still allow enough twist to be applied to the screwhead or bolthead. However, as figure 5 shows, the typical tool kit for the electronic equipment repairman contains an assortment of flat tip and Phillips' cross tip screwdrivers. In figure 5, items A thru E are flat tip screwdrivers; items F and G, cross tip, Phillips' No. 2 size and No. 1 size respectively.

c. Wrenches: With a wrench, you can apply much more leverage or torque to a bolt or a nut then you can with the ordinary straight-shank screwdriver. A good mechanic knows his wrenches and how to use them. He never uses any wrench as a hammer. He always selects the right wrench for a particular task. Whenever he has to tighten a nut or a bolt, he uses a wrench of sufficient length for applying enough torque or leverage to tighten it as much as necessary, but not too much. With a wrench that's too long for the task, a 'heavy-handed" mechanic may overtorque something, with embarrassing results such as a cracked casting, a bolt with its head snapped off, a bolt broken in two, a nut with stripped threads, or a nut that has pulled a bolt in two. On the other hand, a wrench not long enough for the task may create several bad situations. If the mechanic desires to loosen a tight nut or bolt, for instance, and his wrench is too short, he may not be able to apply enough torque to even budge the nut or bolt. If he has to tighten or fasten the nut or bolt, and his wrench is too short, the result may be that the nut or bolt

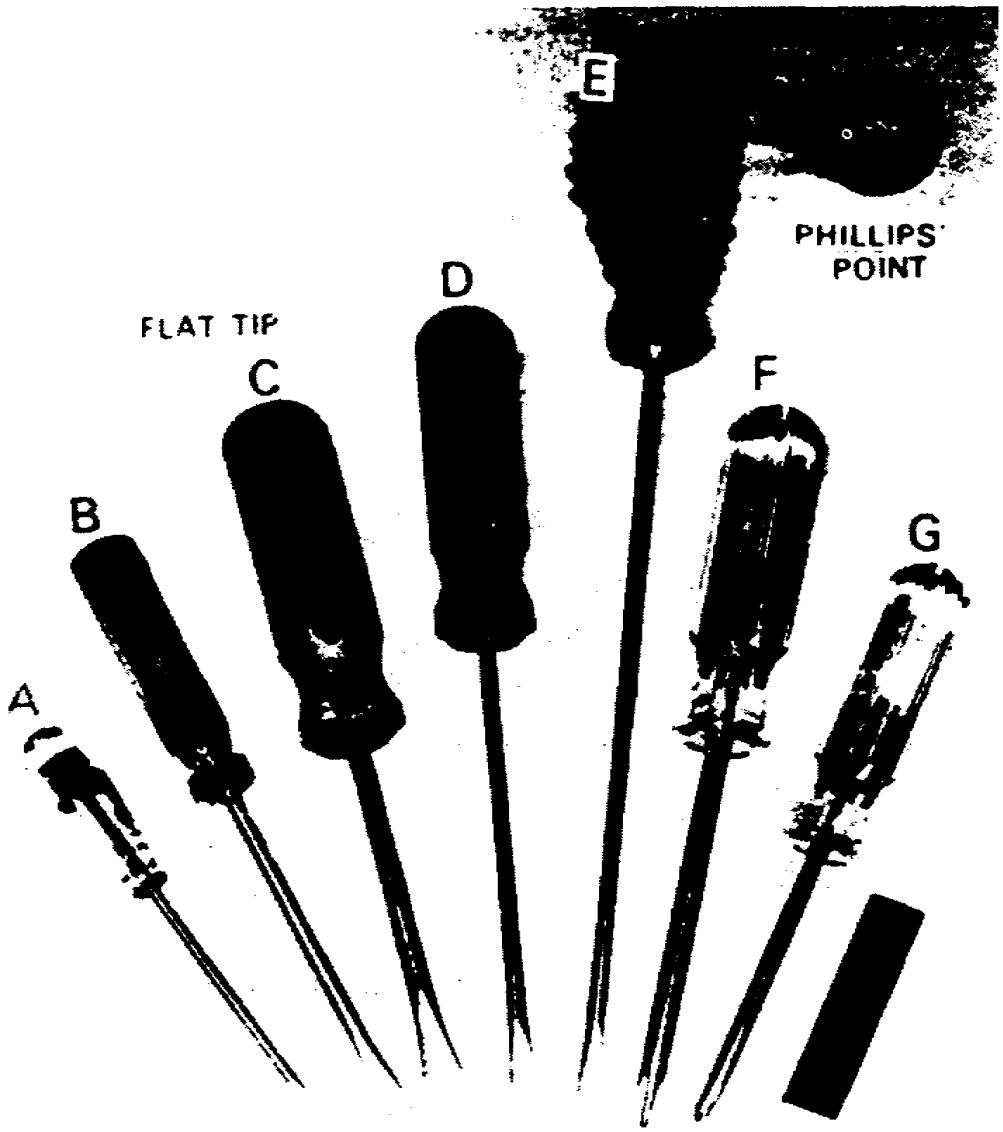

Figure 5. Screwdrivers.

is not drawn up tight enough, and, once the equipment is in operation, some vital part may malfunction, shake loose, be damaged, or be lost. Choose and use the right wrench in the right way for the job that has to be done. Wrenches come in a great assortment of configurations. A few types even resemble pliers so closely that one commercial catalog may describe such items as pliers, while another calls them wrenches. Generally speaking, there are two categories of wrenches: adjustable and nonadjustable. The wrenches in a TK-105/G can be further categorized and described as follows:

(1) Open-end wrenches (fig 6). Item A is a 6-inch adjustable open-end wrench. Its jaws will accommodate any square- or hexagonal-head bolt or any square nut or hexagonal nut up to three-quarters of an inch. Larger sizes are available but this 6-inch one is the only adjustable wrench furnished in a TK-105/G. Items B through F are

nonadjustsable open-end wrenches. Each wrench here has a fixed jaw on each end. The longest wrench shown here has a 3/8-inch jaw on one end and a 5/16-inch jaw on the opposite end; the smallest has a 13/64-inch jaw on one end and a 7/32-inch jaw on the opposite end. The sizes included in a TK-105/G are very useful on the small nuts and bolts encountered on chassis work, terminal boards, and lightweight mountings.

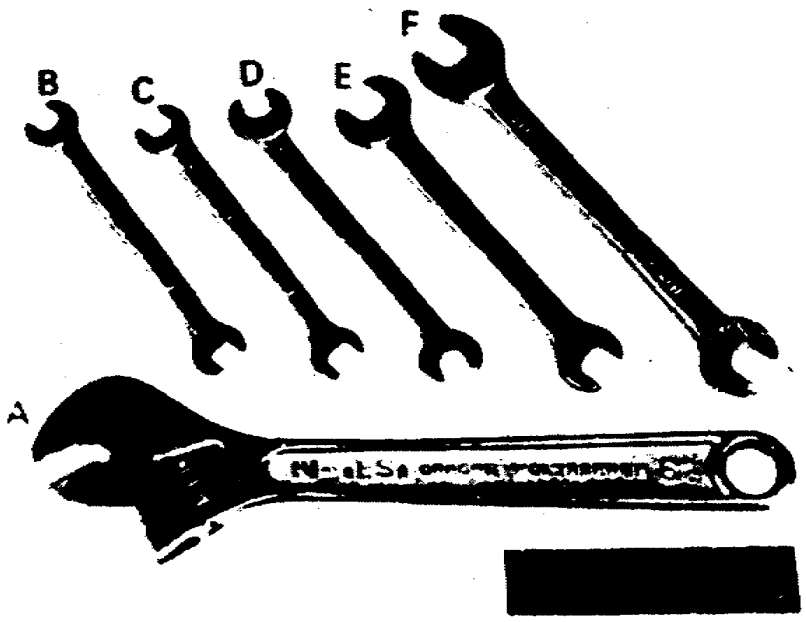

Figure 6. Wrenches: adjustable and open-end.

(2) Socket wrenches (fig. 7). A socket wrench is made up basically of two parts: a socket and a handle. The TK-105/G has a metal box containing a set of sockets and handles. The sizes of the sockets in this kit are suitable for radio mechanics and electronic equipment repairmen working in the field. However, in production-line shops, such as those that do general support maintenance and depot maintenance, the maintenance man who has to do assembly or disassembly hour after hour may be equipped with ratchet handles, speed handles, extensions, flex-joints, and other attachments which take sockets essentially similar to those shown in figure 7.

(3) Spanners (fig. 8). This spanner wrench set consists of five pressed steel spanners of several sizes, together with a handle. They are specially designed for the purpose of tightening and unfastening Amphenol connector locking rings. Such rings serve to hold the receptacle portion of the Amphenol connector to the chassis of an equipment or equipment component. Power cables, audio cables, and other types of interconnecting cables often have Amphenol plugs

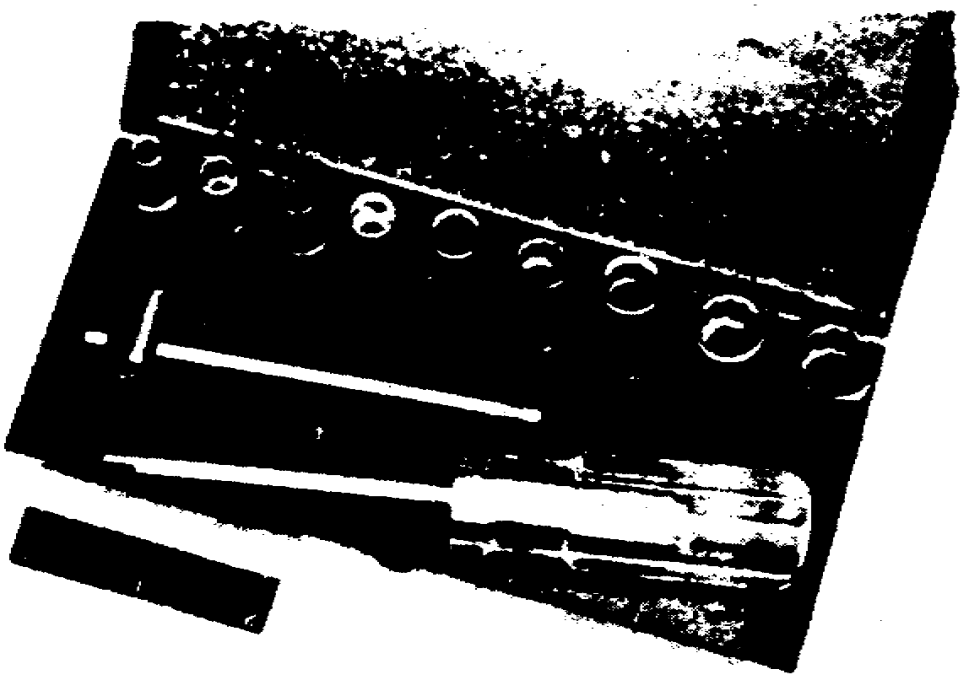

Figure 7. Wrenches: kit of sockets and handles.

Figure 8. Wrenches: set of five spanners and handle.

which mate with Amphenol receptacles. Thus, receptacles must be mounted firmly by the locking rings which take these unique spanners. Receptacles always must be properly installed to withstand the tugs, jerks, pulls, and yanks of cables and cords. Consequently, these five spanners are for the five standardized sizes of this style of connector for military use.

(4) Key sets (fig. 9). Two types of key sets come in a TK-105/G. One set of 12 is the allen type in assorted sizes. The other set consists of six spline-type keys of assorted sizes. Both types of wrenches are often referred to as setscrew wrenches, or keys. The cross section of an allen wrench is hexagonal, to fit the hexagonal recess in the head of an allen screw. Examination of a spline-type wrench, or spline key, reveals six grooves or slots cut longitudinally in the shaft and equally spaced around the shaft. Similar to the allen screw and allen wrench in principle, the spline wrench fits into the internally splined recess in the head of a spline screw. The spline-type design is not so commonly used as the allen design, so the spline keys in this electronic repairman's tool kit have been limited to the six sizes shown here.

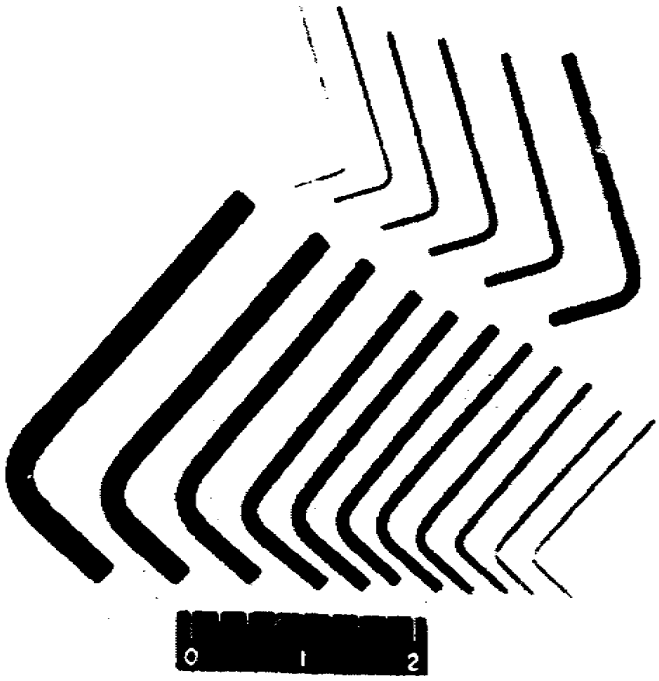

Figure 9. Wrenches: key sets (allen-type and spline-type)

d. Soldering Implements. Soldering of parts in electrical or electronic circuits is a skill that calls for a repairman's having the right implements practically at his finger tips. Some of the articles you'll use in soldering may seem downright homely, but they're nonetheless useful. Others are high-quality tools designed solely for use in soldering.

(1) Soldering outfit (fig. 10). This 55-watt soldering iron is temperature controlled. Nine assorted tips are included with it. Everything comes in a metal box small enough to fit in the tool chest along with the rest of the tools that make up a TK-105/G. Note particularly the various shapes and sizes of the tips you can use with this lightweight soldering iron. The tip seen chucked in the iron gives 600° Fahrenheit temperature. A marking on each tip tells the heat that the tip is designed to give. Shown here unchucked are these tips: two curved fine-point tips, one for 500° F and one for 600° F; a 750° F stub point (second from left); a 750° F straight, flat point (third from left); a 750° F sharp point; a 500° F fine point; a 500° F eight-angle flat point (third from right); and a 500° F "hoe" blade (second from right).

(2) Items for use in soldering (fig. 11). Solder (shown at upper right) is a lead-tin alloy in the form of wire with a rosin core. Rosin-core solder is the preferred type of solder to use in electrical and electronic work, because it doesn't tend to corrode soldered connections the way acid-core or acid-flux solder does. Your local unit or shop supply replenishes your supply of solder as you need it. One pound comes wound on the spool. Being a soft metal, and only about 1/32 of an inch in diameter, it is easily cut off with diagonal cutters. The solder remover syringe (shown at upper left) is used to remove excess "blobs" of molten solder. This syringe could come in handy for other uses too; for instance, to blow away dust from something that is to be soldered, to hold or dispense drops of water to cool off a hot, molten blob of solder that is dropped where you don't want it, or to blow away filings from a workpiece, etc. But by using this syringe as intended, you can make a neatly soldered connection instead of a lumpy, sloppy one that might be rejected by the shop's inspector or quality control element. A heatsink pliers (shown at top center) is often referred to simply as a heatsink. It is a metal clamp used to conduct heat away from parts that might become damaged by too much heat while you solder. Shown beneath the heatsink pliers is craftsman's tweezers, quite helpful in picking up tiny parts and positioning them as necessary. Such tweezers additionally can serve as a heatsink. Under the tweezers is a soldering aid tool. With insulated handle and fingerlike tip, and a metal-bristled brush on the opposite end, the soldering aid tool saves your fingers from getting burnt and extends your reach into tough-to-get-at places where you must solder. The ordinary varnish brush is not only handy for brushing away dust and dirt from what is to be soldered, but it is also good for brushing away the stray flecks of solder from things whenever drops of molten solder accidentally have dislodged from the tip of your soldering iron and splattered. After a soldering job is over, a brush like this can be used to apply moisture-fungus proofing (MFP), especially if the equipment is going to be used in the tropics.

e. Special-Purpose Tools (fig. 12). The forceps-like or pliers-like tool shown here is a tube extractor. The item that looks like a short section of pipe is really a pin straightener.

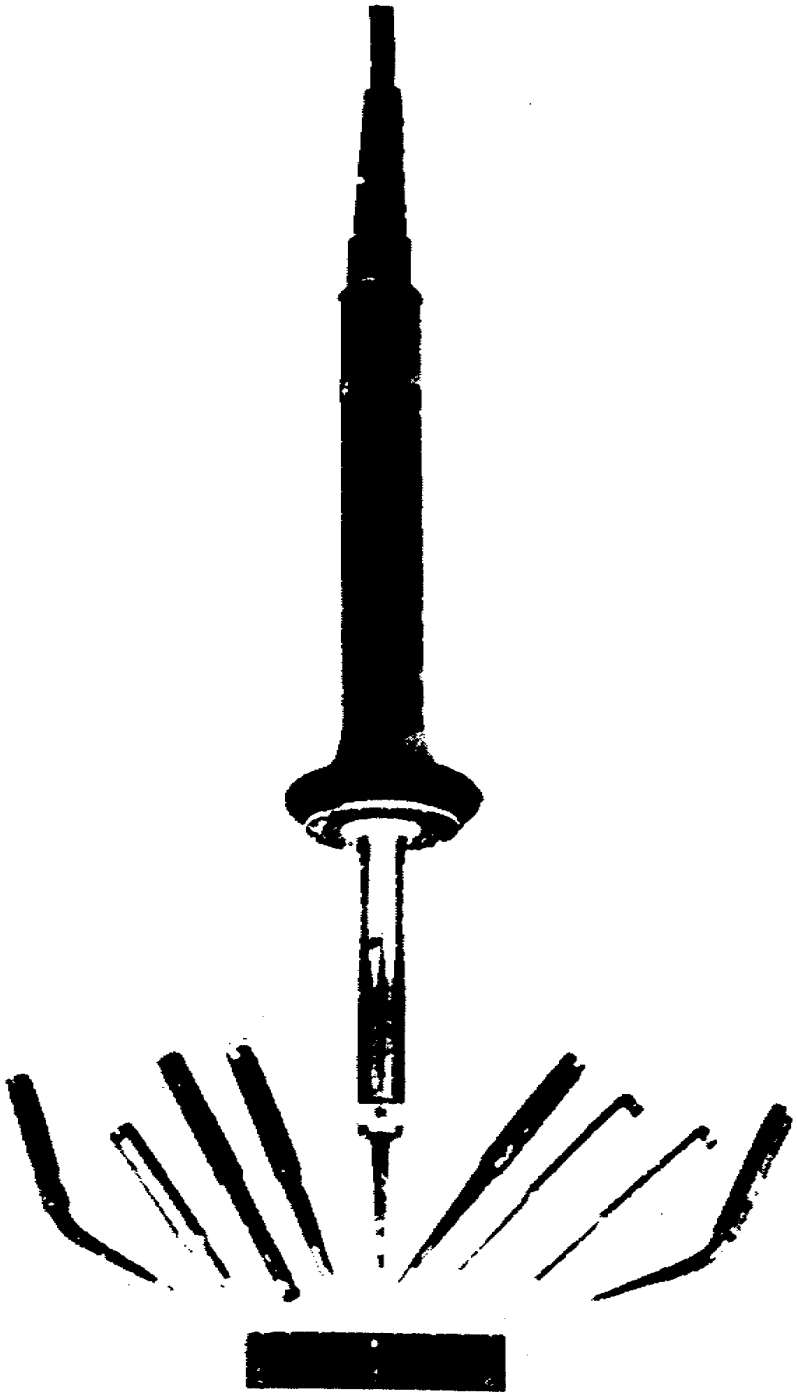

Figure 10. Soldering kit: soldering iron an assorted tips.

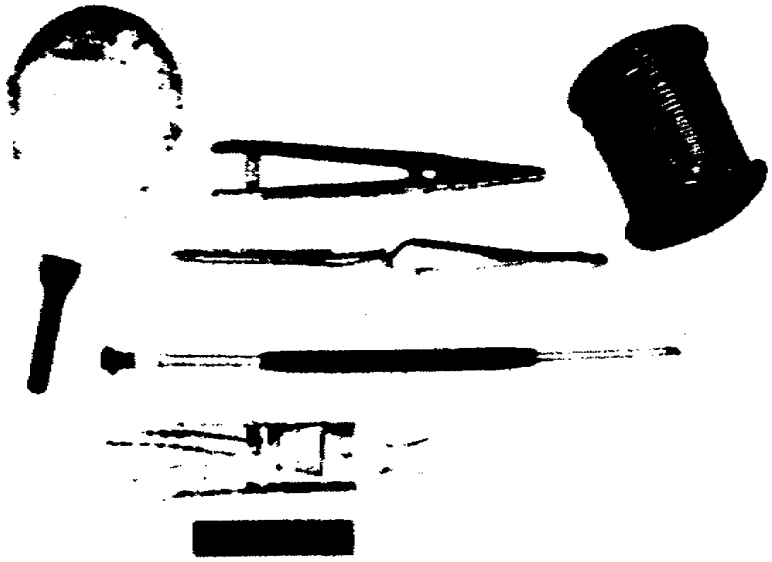

Figure 11. Items for use in soldering.

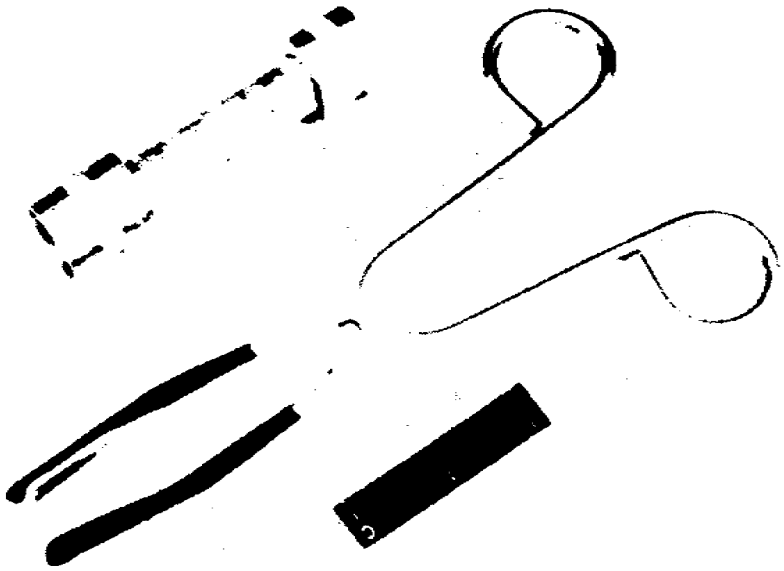

Figure 12. Special-purpose tools: tube extractor and pin straightener.

(1) A tube extractor enables you to remove electron tubes from their sockets. It is a great help in pulling out tubes that are still hot or that are in hard-to-get-at locations where you cannot grasp and pull out the tubes with your fingers. The dark portion of the extractor is a rather soft, nonslippery plastic coating to allow a good grip on the glass sides of a tube.

(2) The pin straightener consists of a die on either end. One end is for seven-pin tubes, the other for nine-pin tubes. You operate the tool by simply pushing the pins portion of the tube into the appropriate die which resembles a tube socket. This action straightens any bent pins the tube may have. You then remove the tube from the die of the straightener, and put the tube back in its regular socket or return it to wherever a supply of good tubes may be kept. Most tube straighteners are of aluminum carefully machined as a precision tool.

f. Other Special-Purpose Tools (fig. 13).

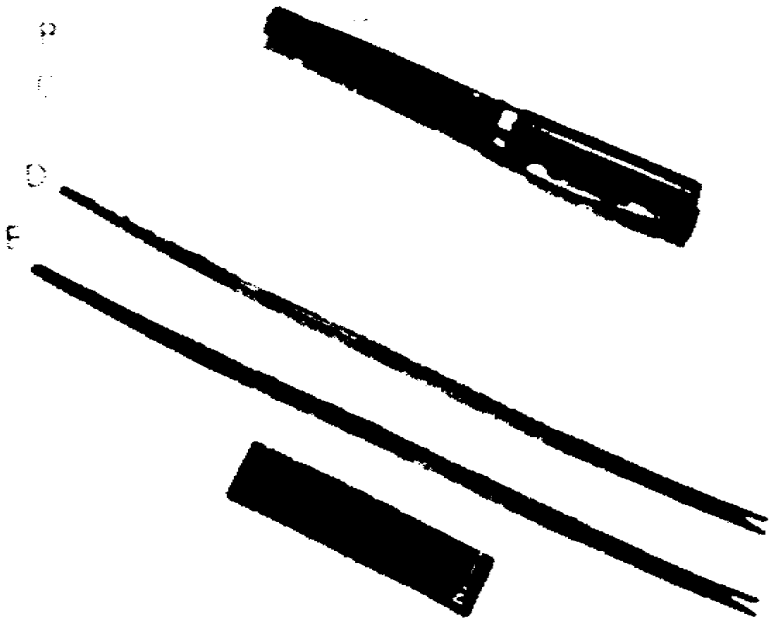

Figure 13. Special-purpose tools: burnisher, alignment tools, and orangewood sticks.

(1) Contact burnisher. Dirty contact points in relays and in other circuit components may cause electrical and electronic equipment to malfunction. Then is when the burnisher (item A) can help you rub contact points until they are shiny and clean, and able to seat against one another properly for a good electrical connection. The burnisher comes apart like a fountain pen. Inside its handle

several very fine blades and rods are usually stored. Either a blade or a rod must be chucked into the collet on the working end of the handle whenever you use this tool. Made of nonmagnetic metal, blades and rods won't gouge or mar delicate contacts. The texture of a blade is such that when you feel across its surface you get the sensation of serrations finer than those of the finest metal-working files. The rod colleted in the burnisher shown has a spherical or globular point useful in getting dirt out of pitted contact points in polar relays.

(2) Alignment tool. The two alignment tools furnished in a TK-105/G appear in figure 13 as items B and C. An alignment tool is made of fiber, plastic, or any other suitable material that is a nonconductor of electricity, and is thus immune to electromagnetic effect or influence. It is used in adjusting the components of a circuit that might be affected by the presence of metal. NEVER use your alignment tool as a screwdriver, and NEVER use a screwdriver where an alignment tool is required.

(3) Orangewood stick. Two identical orangewood sticks are issued in a TK-l05/G (items D and E). Although intended for separating hot or live wires while checking out or working on a circuit, you will find a number of other practical uses for the orangewood stick. For instance, the stick is useful to hold aside parts and wires that get in the way when soldering in tight quarters. It can help you hold down parts being soldered or unsoldered; it can pinch-hit as an alignment tool, a burnisher of contacts that are not too dirty, or a mechanical finger to pick up or position parts.

g. Miscellaneous (fig. 14).

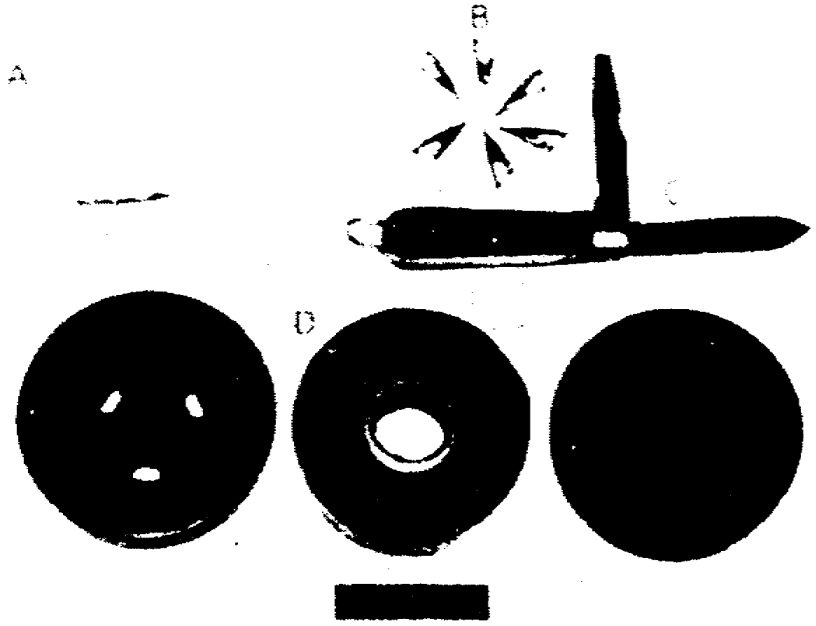

Figure 14. Miscellaneous items in TK-105/G.

(1) Cheesecloth (item A) and alcohol are used in cleaning electrical contacts, metal parts to be soldered, and so forth. In some issues of the TK-105/G a little can of alcohol may be included.

(2) Six Microgator clips (item B) are useful in devising electrical arrangements for the testing and troubleshooting of circuits. Besides serving as temporary electrical connectors, they can serve as miniature clamps to hold tiny items in place while soldering, and as little heatsinks. The Microgator clip, while suitable for connections in shop tests of operating equipment, is too small for connecting test leads to line binding posts for field cable and wire connection. For this purpose, Test Clip TL-137 is more suitable. The TK-105/G does not include TL-137's, but wiremen and linemen will need them.

(3) An electrician's knife (item C) is a multipurpose tool, useful and versatile in repair and maintenance work.

(4) A roll of electrical insulating tape (item D) is supplied with the TK-105/G. The circular plastic shells on either side of the tape fit together and make a good container for keeping your tape clean.

h. Items for Use in Inspecting (fig. 15). If you are going to fix the equipment right, you must be able to see, observe, and inspect details closely. These tools will help you do so.

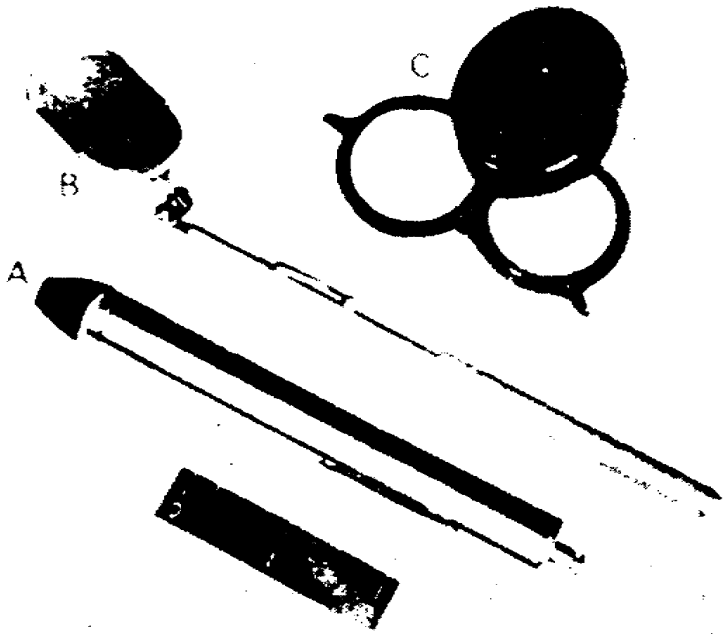

Figure 15. Tools for use in inspecting.

(1) An inspection light (item A), either a commercial or a military-type flashlight, should be in every mechanic's or repairman's tool kit. A good technician always has a good, operable light.

(2) The inspection mirror (item B), elliptical in shape and adjustable to any angle, enables you to see into places inside the equipment where otherwise it would be hard or impossible to do without further taking the equipment apart. The mirror also may be handy in reflecting light to a spot where you need it.

(3) The folding pocket-type magnifier (item C) is good for checking for breaks in printed circuitry, and for inspecting soldered joints and other items where a close look or a close, fine job is in order.

6. PROPERTY RESPONSIBILITY

The tools, test equipment, and shop items you use belong to the Army. Any Government property which you use or which has been issued to you is property for which you are personally responsible. Personal responsibility means that you have the obligation to use that property for its intended purpose, to properly care for it, and to adequately safeguard it from loss, damage, or destruction. This property responsibility applies to all types of items entrusted to you, whether classed as nonexpendable or expendable. Any item of Government property you use or possess becomes your responsibility, whether you have signed for it or not. You may have to pay or reimburse the Government for property loss or damage that occurs through your fault. Of course, a true craftsman takes pride in properly using and caring for the tools and other things he uses in his work, so the chances are that seldom, if ever, you'll be held financially liable for property loss or damage.

7. SAFETY ON THE JOB

Safety may be simply defined as keeping yourself and others free from danger or hazards. Around any place where people are working with tools and materials we have danger and hazards. In military operations we need and we therefore use a large assortment of equipment, both mechanical and electrical. Many of the items require high voltages to operate. In some tasks, ladders and other climbing and elevating aids must be used. Loads must be lifted by brawn or by materials handling equipment. Items often must be stacked or piled up in a storage or holding area. Under any of these conditions, a hazardous situation can crop up if someone fails to think safety and act safely in the working environment. So safety is of importance to you yourself and to you in relation to all those individuals with whom you happen to be associated. You should place the safety of yourself and others high on your list of personal obligations. Your concern for safety should be all the time--on the job, going to and from work, at home, at play, and, in fact, wherever you may be. Many manhours are lost annually by people who forget safety when off duty.

8. ACCIDENT PREVENTION

Safety is a goal that can be attained by preventing accidents.

a. Definition of "Accident." Webster's Dictionary says: "An event that takes place without one's foresight or expectation, especially of an afflictive or unfortunate character; a casualty." Of course, accidents may include not only occurrences in which personal injury, or death, or property damage or loss results, but also those instances resulting simply in delay or loss of time even if there is no physical harm to person or to property.

b. Accident Prevention. Accidents cannot occur unless some person acts unsafely or is exposed to a mechanical or physical hazard. This means that it is better to locate and correct unsafe conditions and unsafe acts before they cause an accident, rather than to let an accident occur and then determine such conditions or acts as having caused an injury or death or avoidable loss of time. Don't wait for an accident to happen. Take steps to prevent it. We should eliminate all hazards--hazardous conditions and hazardous procedures or techniques--before they cause an accident.

c. Steps to Safety.

(1) Know about hazards. All hazards can be classified as unsafe acts (personnel) or unsafe conditions (mechanical or physical), or in some cases a combination of unsafe acts and unsafe conditions. An unsafe act might be an act of commission, such as cleaning a machine in motion, using tools or machines for purposes for which they were not intended, or maintaining such equipment improperly. On the other hand, an unsafe act might be an act of omission, such as failing to tie down a load on a truck, not fastening a seat belt, or not bothering to use the guard provided on a machine. Unsafe conditions include oily or slippery floors; congested aisles; protruding objects; presence of gases, fumes, dangerous radiations of various types (electromagnetic, X-ray, nuclear or atomic, etc.); badly worn vehicle or machinery components such as tires, brakes, bearings, insulation on wiring, imbalanced moving parts, etc.--anything that can cause falls. One toxic hazard recently brought especially to the attention of all Army personnel is the gas given off from overheated selenium rectifiers. (Selenium and its compounds are toxic, being physiologically related to arsenic compounds.) In the long run, virtually all hazards are traceable to the human element, in other words, some unsafe personnel factor. Always ask the question: Why does the hazard exist? Here are some reasons:

(a) Person(s) may not be convinced that a certain practice is unsafe.

(b) A better or safer way of doing a particular task may not be known to the doer or his supervisor.

(c) The safe way of doing a certain job, task, or operation may be rather inconvenient or uncomfortable.

(d) The safe technique may be somewhat slower, more time consuming than a short-cut method.

(e) The safe practice may entail a more difficult or complicated procedure.

(f) Person(s) may be downright reckless.

(g) Person(s) may be disobedient.

(h) Person(s) may act wrongly through force of habit instead of by deliberate and careful thinking.

(i) Person(s) may be overly excitable, temperamental, or nervous.

(j) Person(s) may be physically or mentally unfit, for example, ill, drunk, very tired, exhausted, etc.

(2) Find, name, identify, and analyze hazards. A general knowledge of hazards is not enough. Any hazard must be found, named, identified, and studied before we can do something to eliminate or at least reduce it to a tolerable minimum. If you think you have discovered a hazard, talk the matter over with other members of your shop, and particularly with your supervisor. Then something can be done to get rid of, or reduce, the hazard.

(3) Suggest or select a remedy. Once a hazard is located, identified, and analyzed, the best method of eliminating it must be found. The remedy in all cases must be practical, effective, and economical. The remedy will usually take some form of engineering, education, or enforcement. For instance, designing guards to use on a certain machine would be a form of engineering. Instruction in the correct, safe way of doing a particular task would be a form of education or training. Disciplinary action against those who violate shop safety rules would be one kind of enforcement.

(4) Apply the remedy. Once the remedy has been decided upon, it should be applied. Actually, application of the remedy requires "selling" the remedy to everybody concerned and overcoming obstacles to it. The obstacle usually can -be identified as a person, an attitude, or a circumstance, or some combination of those factors. Typical excuses for not being in favor of applying a remedy are: "It'll cost too much." Or, "It'll interfere with our operations." Or, "I don't think the hazard is serious enough to bother about." Various types of appeal, persuasion, and training will usually overcome the obstacles, however. In accident prevention, all thought and all action should concentrate on elimination of hazards. We have the know-how to prevent about 99 percent of all accidents. Let's apply this know-how to achieve our goal: safety.

Section III. FIRST AID

9. GENERAL

If an accident does occur, each of us should be prepared to help the victim until the physician can take over. The Army does expect every soldier to be able to give first aid, and so a field manual, FM 21-11, covers the subject, "First Aid for Soldiers." The intent here is to refresh your knowledge of those first aid procedures most often needed in the working environment of a maintenance shop where electrical and electronic items are being repaired.

10. RESCUE BREATHING/ARTIFICIAL RESPIRATION

a. Nature of Accidents Where Victim Needs Artificial Respiration.

(1) Drowning. Drowning occurs whenever water, vomit, or any other fluid enters the victim's breathing passages in sufficient quantities to

prevent air from entering the lungs and supplying oxygen to the vital centers of the body. Sometimes very small amounts of water or other fluids can cause drowning.

(2) Electric shock. Such an accident frequently results from contact with a "live" wire. Occasionally a person is struck by lightning.

(3) Carbon monoxide poisoning. Odorless and colorless, carbon monoxide gas kills without warning. Internal combustion engines, open fires, stoves, lanterns, and charcoal fires give off this deadly gas. Without adequate ventilation where any of these combustion devices are being used, someone may be overcome. Symptoms of the victim may be dizziness, weakness, headache, vomiting--then unconsciousness. The skin and lips are often bright red.

b. Symptoms of Victims in Need of Artificial Respiration.

(1) Not breathing. The most critical medical emergency with which anyone may be faced is the person who has ceased to breathe. The person will inevitably die within minutes unless prompt measures are taken to restore a flow of oxygen to the brain before irreversible changes have occurred in the brain. The heart may continue to pump blood for a period of time after breathing has stopped, so if we can immediately supply oxygen to the circulating blood and continue until the victim's breathing has spontaneously returned (or until he is unequivocably dead), life will be saved.

(2) Usually completely relaxed. The victim who requires artificial respiration is almost always totally unconscious and completely relaxed. In fact, he appears lifeless.

c. What to Do With the Victim Before Applying Artificial Respiration.

(1) For the drowning victim: As soon as you can get his head out of the water and your mouth to his, start the mouth-to-mouth method of artificial respiration. Time is of the essence. Don't waste valuable seconds turning the victim in an attempt to drain water from the lungs.

(2) For the electric shock victim: If the victim has come in contact with an electric current, turn off the switch if it is nearby, but DON'T waste time looking for it. Use a dry wooden pole, dry clothing, dry rope, or some other material that does not conduct electricity to remove the person from the wire. If a pole isn't handy, simply drag the victim off the wire by means of a loop of dry cloth. Do not touch the wire or the victim with your bare hands, or you also may get a shock. Electric shock causes breathing to stop, so begin artificial respiration immediately after freeing the person from the wire or "electrically hot" item.

(3) For the carbon monoxide victim: Get him into fresh air and start artificial respiration immediately. Keep him quiet.

d. General Principles in Giving Artificial Respiration. In performing any method of artificial respiration, you must always keep certain general principles in mind.

(1) Begin at once. DO NOT take time to move the victim to a better place. DO NOT delay artificial respiration to loosen clothing, to warm the victim, or to give him stimulants. These measures are secondary; the most important thing to do is to get air into the victim's lungs.

(2) Quickly sweep your fingers through the victim's mouth to clear out froth and debris, and draw his tongue forward.

(3) Position the casualty to maintain an open airway. Keep his head as far back as possible so that the front of his neck is stretched with the chin in a "jutting-out" position. Do NOT let the chin sag.

(4) Begin artificial respiration and continue it without interruption until the casualty either starts natural breathing or is pronounced dead. A smooth rhythm is desirable, but split-second timing is not essential.

(5) Never wait for a mechanical resuscitator to be brought to the scene of an accident, nor for an untrained operator to read instructions and learn to use the equipment. Instead, start artificial respiration without delay, and then, when a properly operating, approved mechanical resuscitator with a trained operator becomes available, use it.

(6) If the casualty begins to breathe on his own, adjust your timing to assist him. Do NOT fight his attempts to breathe. Synchronize your efforts with his.

(7) As soon as the casualty is breathing for himself, or when additional help becomes available, see that his clothing is loosened (or, if wet, removed), that he is kept warm, and that he is being treated for traumatic shock. Do NOT, however, interrupt artificial respiration to do this.

e. The Mouth-to-Mouth Method (fig. 16). The Army prefers this method and its variations, because they permit more air to enter the victim's lungs than do any other known manual methods. Here is the preferred mouth-to-mouth method:

(1) Place the casualty on his back (face up). Do NOT put anything under

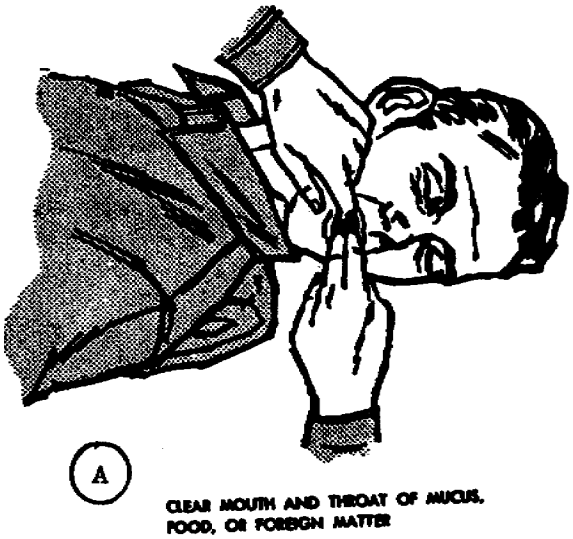

Figure 16. Mouth-to-mouth method of rescue breathing.

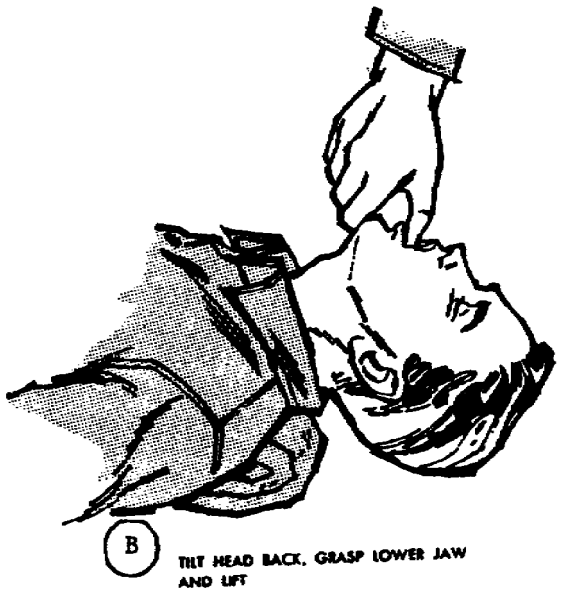

Figure 16. Continued.

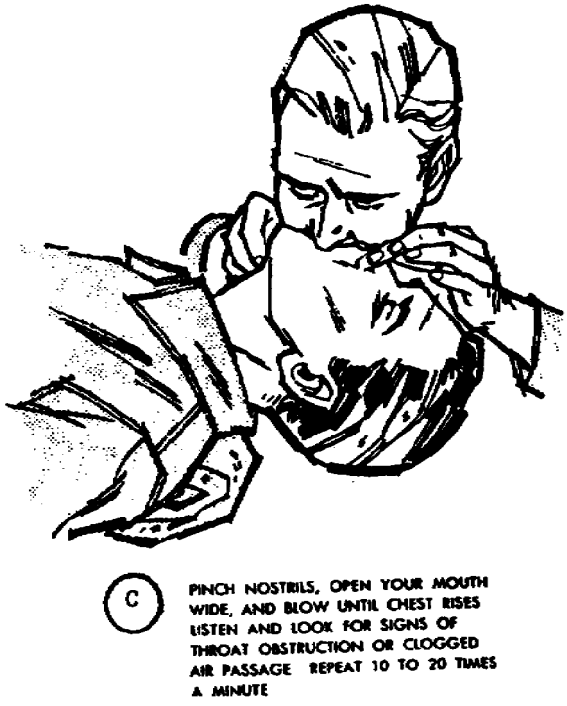

Figure 16. Continued.

his head. It may flex the neck and block the air passages.

(2) Quickly clear his mouth of any foreign matter by running your fingers behind his lower teeth and over the back of his tongue (A in fig. 16). Wipe out any fluid, vomitus, or mucus.

(3) If available (DON'T waste time looking for these materials), place a rolled blanket or some other material under the shoulders so that the head will drop backward. Tilt his head back so that the neck is stretched and the head is in the chin-up position (B and C in fig. 16). This aligns the air passages so that they do not become blocked by kinking or pressure.

(4) Place your thumb into the corner of his mouth and grasp the lower jaw firmly (B in fig. 16). Lift the lower jaw forward to pull the tongue forward, out of the air passage. Do NOT attempt to hold or depress the tongue.

(5) With your other hand, pinch his nose shut to prevent air leakage (C in fig. 16).

(6) Take a deep breath and open your mouth wide. Seal your mouth around the victim's mouth and your thumb, and blow forcefully (except for infant or small child) into his mouth until you see his chest rise (C in fig. 16). (If the chest does not rise, hold the jaw up more forcefully and blow harder while making sure there is no blockage of the air passage and no leakage around the mouth or nose.)

(7) When his chest rises, stop blowing and quickly remove your mouth from his. Take another deep breath while listening for his exhalation. (If his exhalation is noisy, elevate his jaw further.)

(8) When exhalation is finished, blow in the next deep breath. The first 5 to 10 breaths must be deep (except for an infant or small child) and given at a rapid rate in order to provide rapid reoxygenation. Thereafter, continue breathing at a rate of 12 to 20 times a minute until the casualty begins to breathe normally.

CAUTION: Excessively deep and rapid breathing may cause you to become faint, to tingle, or even lose consciousness. Therefore, after the first 5 to 10 breaths, adjust your breathing to a rate of 12 to 20 times a minute with only moderate increase in normal volume. In this way, rescue breathing can be continued for long periods without fatigue.

(9) After performing rescue breathing for a period of time, you may notice the victim's stomach is bulging. This is from air being blown into the stomach instead of the lungs. Although inflation of the stomach is not dangerous, it makes inflation of the lungs more difficult. Therefore, when you see the stomach bulging to a marked degree, apply gentle pressure to it with your hand between inflations.

(10) Remember: Keep the air passages as clear of fluid and other obstructions as possible; keep the head back, the neck stretched, and the chin pulled forward; readjust position if air does not flow freely in and out of casualty; do not breathe too forcibly or in too large a volume if casualty is an infant or small child; in infants seal both the mouth and the nose with your mouth, and blow with small puffs of air from the cheeks rather than from the lungs; if you become distressed as a result of the shallow breaths, interrupt the blowing long enough to take a deep breath, then resume blowing.

11. TREATMENT OF BURNS

Whenever someone suffers a burn, you should be able to estimate the seriousness, or degree, of the burn. So the first question to answer, is this: How serious is the burn? A second question is this: What caused the burn--electrical contact, a hot object, steam, dry heat, chemicals, radiation, or what? A burn should be treated according to the seriousness and the nature of the burn. Minor burns are those in which no blistering or charring exists and where only small skin areas are involved. Serious burns are those in which there is blistering or charring, or those in which large areas of the body are involved.

a. Degree of Burn. Burns are usually classified according to the depth to which the skin has been injured. Data in the chart below will help you recognize how serious a victim's burns are.

DEGREE	SYMPTOMS
First	Skin red but unbroken: Superficial--no damage to deeper skin or tissue. No blisters: Will heal without treatment. Does not leave a scar.
Second	Deep reddening of skin. Skin blisters. Some breaking of skin. Damage to deeper skin layers. No damage to tissues under skin layers. Usually heal with little scarring. Can be very serious if over extensive area of body.
Third	Destruction of skin layers and underlying tissues--extremely deep--may even be down to bone. Often charred and blackened appearance. Successful treatment possible if area burned is not too extensive. Surgical care and skin grafting required.

b. Emergency Treatment. Minor burns should be covered with sterile gauze compresses (pads) from a first aid kit to protect the burned area from infection. If no sterile dressing is available, leave the burn uncovered. In serious burns, your prime consideration is to note any burn shock the patient may suffer and treat him for such shock. Burn shock usually occurs when a second-degree burn, or worse, covers more than 15 percent of the body's surface area.

(1) Treat for burn shock. Shock is a condition of great weakness of the body. It can result in death. Severe burns cause shock. The casualty has extreme thirst, is restless and disoriented, and may be vomiting, nervous, and sweaty. To prevent or treat for shock, make him comfortable. Loosen his belt and clothes. Handle him very gently. Put him in a comfortable position, such as lying down or sitting; lying down lets the blood flow to his brain and may keep him from passing out. If he is conscious, is not vomiting, and has no belly injury, give him small amounts of cool or cold water to which you have added salt or salt and baking soda. Dissolve 4 salt tablets or 1/2 teaspoonful of loose salt per quart of cool or cold water. Give the solution to the casualty gradually, a few sips every few minutes. Then slowly increase the amount until he is drinking about 1/3 of a canteen cup every hour. This solution helps

restore the body fluids and salts which a burn casualty loses. Caution: If the victim vomits or even acts as if he might, do not give him any more of the solution. Never use warm water to make the solution. Warm salt water can cause vomiting.

(2) Treat to prevent infection. With severe burns, there is a great danger of infection. Cover the burned area carefully with dry, sterile dressing. If clothing covers the burn, cut the cloth and lift it gently away. Call a physician.

(a) Do NOT pull clothes over the burned area.

(b) Do NOT try to remove pieces of cloth that stick to the skin.

(c) Do NOT try to clean the burn.

(d) Do NOT break burn blisters.

(e) Do NOT put grease, vaseline, or ointment on the burn--NO medications whatsoever.

(f) Do NOT touch the burn with anything except a sterile dressing.

12. CONTROL OF BLEEDING

a. A Vital Rule: Stop the Bleeding Fast. An average man, weighing about 150 pounds, has about 7 quarts of blood. If 50 percent of the blood is lost within minutes or even a few hours, the usual result is death. The loss of 15 to 25 percent will induce shock. Thus, sudden blood loss, or acute hemorrhage, calls for quick action to stem the flow of blood from the body. An average adult might tolerate the sudden loss of a quart of blood, but any greater amount generally becomes a serious matter. Even a small break in the cardiovascular system can let out a lot of blood in a very short time.

b. Recognize the Type of Bleeding. The cardiovascular system, whose job is circulating the blood throughout the body, consists of the heart, arteries, capillaries, and veins. As the heart beats, it pumps blood out into the arteries, which carry fresh blood to all parts of the body. The capillaries distribute the blood farther to all cells in the body. The veins return the blood to the lungs and heart. Consequently, we may describe bleeding as being arterial, capillary, or venous bleeding.

(1) Arterial bleeding. If an artery is cut or severed, the blood appears bright red in color and spurts out with each heartbeat. This type of Hemorrhage requires immediate attention regardless of how slight it may appear. Fortunately, arteries are pretty well protected by surrounding flesh and are near the skin's surface at only a few points on the body.

(2) Capillary bleeding. An example of capillary bleeding would be a superficial cut such as a nick you might get in shaving. The blood is also dark red in color, and it is characterized as a slow oozing.

(3) Venous bleeding. In venous bleeding, the blood appears dark red and does not flow in spurts, but is continuous. Many of the veins are near the surface of the skin, and thus are often involved in shop injuries, such as lacerations, sharp cuts, and punctures.

(4) Internal bleeding. Less obvious than the various kinds of external bleeding is the internal hemorrhage, which occurs within the body, such as in a body cavity or organ. Any indication of blood being coughed up, vomited, or excreted suggests the occurrence of internal hemorrhage, and the case should be turned over to a physician. Always regard any sign of internal bleeding as a serious matter calling for professional diagnosis.

c. There are Various Ways of Treating Severe Bleeding. Pressure directly applied against the wound will stop or slow the bleeding and allow blood to clot. About 5 to 10 minutes will usually suffice. If a sterile gauze pad or compress is handy, press it against the wound. In an emergency, any clean cloth will do. The main thing to do is stop or slow the bleeding. Another way to control bleeding is to elevate the injured part. This lessens blood pressure at the wound site and aids the flow of venous blood from the area. Thus, arterial or venous bleeding may be reduced or slowed by this method. Another technique is using certain pressure points (fig. 17) to control arterial bleeding for a short time until more suitable control can be accomplished by the medical profession. The pressure points are those plates where major arteries lie near the skin surface. Pressure applied at these points will slow or stop the flow of blood to certain areas of the body. Manual pressure followed by the pressure of a bandage usually will keep the bleeding under control. The standard way of manually applying pressure on a pressure point is with the thumb, because it is the strongest digit. But first, the tip of the forefinger, being sensitive, pinpoints the precise location of the pressure point by detecting pulse. Now, with the help of figure 17, let's identify and describe the pressure points.

(1) Carotid. Passing up either side of the neck, the common carotid artery affords a pressure point situated in the lower part of the neck. The carotid arteries are main blood vessels that feed blood to the brain and to lingual, facial, temporal, and occipital branch arteries. Pressure on a carotid artery can stop all blood flow to its side of the head. Since such stoppage could harm the brain, a first aider should use this pressure point only in the most severe cases of bleeding in the head or in the neck above this pressure point.

(2) Facial and occipital. The facial artery and the occipital artery in either left or right half of the head are branches of the carotid. Pressure point for the facial is in a small hollow at the side of the lower jawbone. If the victim clenches his jaw, you can find it easily by feeling its pulse just in front of the jaw-clenching muscle. Pressing this point stems bleeding on the side of the face that is concerned. For bleeding near the middle of the face, you may have to press both the left and the right facial pressure points simultaneously. The pressure point associated with the occipital artery is sometimes hard to find, but it is about midway between

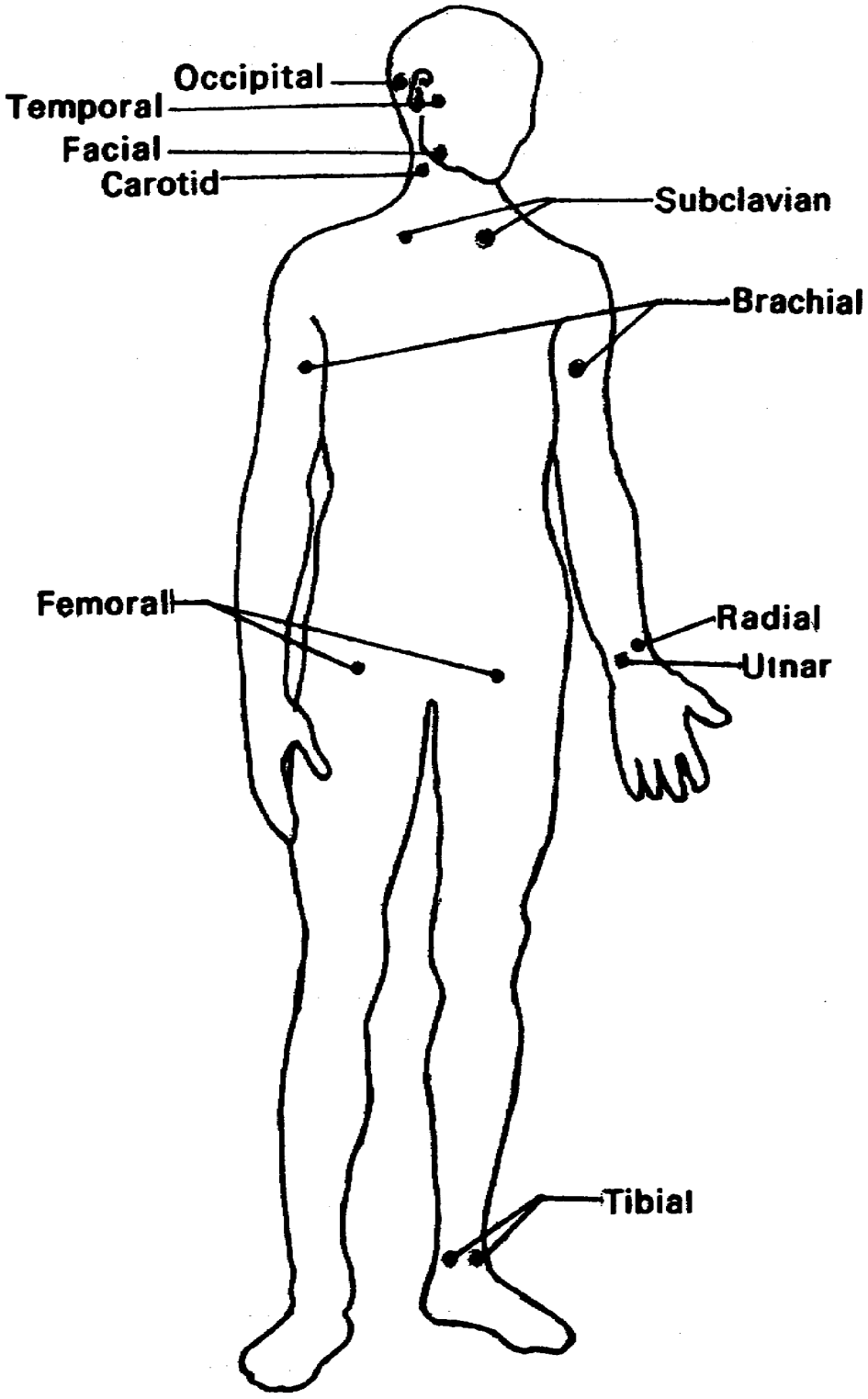

Figure 17. Pressure points for control of bleeding.

the bony knob behind the ear and the middle of the back of the cranium as B depicts. Pressure here will control bleeding that occurs on the back of the scalp.

(3) Temporal. The temporal artery passes upward, often in a meandering route, in front of the ear, and over temple and scalp. Pressing it in front of the ear will control scalp bleeding in front of and above ear level on the left or right side of the head, whichever is involved.

(4) Subclavian. The subclavian arteries (one left and one right) feed blood to shoulders and upper limbs. The pressure point is against the first rib in the hollow immediately above the collarbone. This pressure point is useful especially if wounds are in armpit or upper arm. For the first aider, it is rather tiring to manually keep pressing on this point. For the patient there may be pain as major nerves of the neck are pressed whenever this pressure point is used.

(5) Brachial. The brachial artery is easy to spot as it goes along the groove on the inner side of the biceps muscles. Practically any place along this artery can be used as the pressure point for controlling bleeding of the elbow, forearm, wrist, or hand. Another pressure point along the brachial artery lies at the front of the elbow.

(6) Radial and ulnar. Located at the front (i.e., palm side) of the wrist are pressure points of the radial artery and ulnar artery. These pressure points are used to control arterial bleeding of the palm of the hand.

(7) Femoral. In the middle of the groin is the pressure point for the femoral artery, the main artery which carries blood for the leg. Note how both thumbs are used to increase pressure.

(8) Anterior and posterior tibial. These pressure points, being located at the ankle, are used to control arterial bleeding in the foot; one or both may be used at the same time.

13. TREATMENT OF MINOR CUTS AND SIMILAR INJURIES

Scratches, small cuts, scrapes, and skinned knuckles--we so often pass them off as nothing to bother about. Sometimes we're scarcely aware of them. A sharp edge on a chassis, a burr not filed off, an end of wire protruding like the point of an Lee pick, a wrench slipping off a nut--these are among the many possible causes of small hurts, particularly to fingers, hands, wrists, and forearms of a maintenance man. Attention to such minor injuries will prevent infection and aid healing.

a. Cleanse the Wound. Bleeding is Nature's way of cleaning out the wound, but you should help by cleaning in and around the wound with surgical soap (or any other pure soap) and warm water. Rinse off the soapy water with warm water and let the wound air-dry. If rubbing alcohol or any other antiseptic solution is available, put some on the wound. Take special care to clean out

any dirt that may be embedded in a laceration or abrasion, because such wounds are more likely to become infected than an incision would.

b. Protect the Wound. If the wound is in a spot that easily comes in contact with things, an adhesive compress of suitable size should be applied. This will keep out dirt and help prevent infection. If the wound is a puncture wound--such as holes caused by tacks, nails, needles, screws etc.--there is some possibility that the puncturing item may carry infection that gets trapped in the wound. If there is any doubt as to whether the wound has been adequately cleansed and properly treated, visit your local medical facility. In fact, in a shop or in a unit, you should follow your local directives concerning the reporting of accidents and the handling of casualties by the local medical facility. For the good of everybody concerned, it is best that the immediate supervisor be informed of all accidents and injuries, no matter how seemingly small and insignificant they may be.

LESSON EXERCISES

In each of the following exercises, select the ONE answer that BEST completes the statement or answers the question. Indicate your solution by circling the letter opposite the correct answer in the subcourse booklet.

1. What is the principal mission of the shop organization to which you may be assigned?

   a. Construction of equipment

   b. Maintenance of equipment

   c. Maintenance of buildings

   d. Maintenance of records

2. The document that specifies the task to be performed in repairing an item of equipment is the

   a. work order.

   b. technical manual.

   c. preventive maintenance form.

   d. standard operating procedure.

3. Which of your tools should be within arm's reach?

   a. Those most often needed

   b. Those most expensive

   c. As many as possible

   d. All of them if possible

4. How should a workpiece be positioned?

   a. In such a manner that you can work on the item comfortably, conveniently, and safely

   b. So that a forklift truck or similar materials handling device can pick it up

   c. In such a manner that you can see at least two sides of the item at once

   d. So that the brightest available light can shine on it directly

5. Your supervisor has told you to check at the start of each work day the thermostat that controls the heating system for the building that houses the shop. What would probably be the best temperature setting?

   a. Any above 50°

   b. About 60°

   c. About 70°

   d. About 80°

6. Why are time and effort devoted to keeping a shop or work area clean and neat?

   a. Commanding officers like everything spotless.

   b. Doing so promotes health, safety, and efficiency.

   c. Doing this keeps everybody occupied whenever work is slack.

   d. Cleanliness and neatness provide a pleasant and safe atmosphere.

7. If you spray paint or operate gasoline engines inside a building, you must take the precaution of assuring adequate

   a. air conditioning or air cooling.

   b. evacuation of fumes.

   c. light.

   d. heat.

8. The working end of a Phillips-type screwdriver is a tip shaped like this:

9. From the items shown in figure 18, select an example of diagonal cutting pliers.

   a. Item A
   b. Item B
   c. Item C
   d. Item D

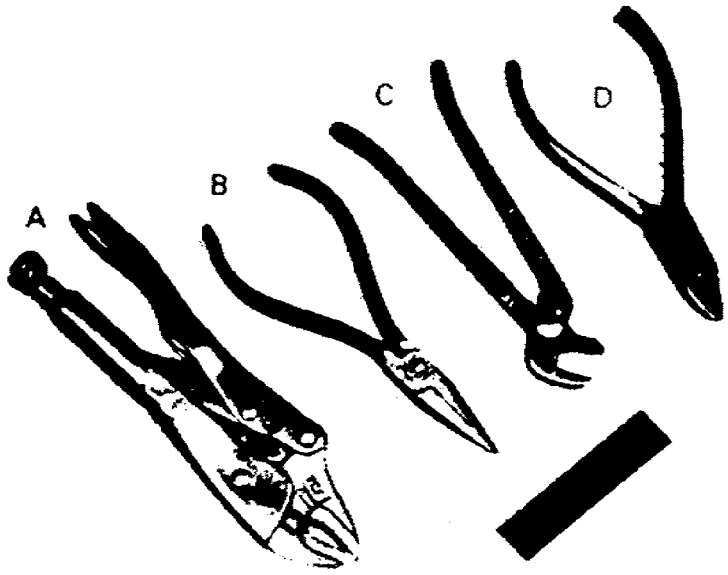

Figure 18. Can you name these tools?

10. Why does a repairman of electronic equipment use a heatsink, or heatsink pliers?

   a. To serve as a substitute for a heavy-duty, high-heat soldering iron
   b. To hold the hot water that surrounds a solder pot
   c. To heat the rosin flux as fast as the solder
   d. To prevent heat damage to circuit parts

11. How can you tell the difference between an alignment tool and a screwdriver?

   a. The alignment tool lacks a handle and a flat tip.
   b. The alignment tool is made of a nonconductive material.
   c. The screwdriver is usually shorter.
   d. The screwdriver is usually longer.

12. You are having difficulty in loosening an ordinary slotted roundhead bolt with your screwdriver. Your grip on the handle keeps slipping and the bolt will not budge. What should you next do in your attempt to loosen the bolt?

a. Obtain a square-shank screwdriver and an adjustable open-end wrench to apply more leverage co the screwdriver and bolt.

b. Obtain a vise-grip or lever-action wrench, and adjust it to grasp the head of the bolt; then turn the wrench counterclockwise.

c. Get a steel chisel and a ball peen hammer, and shear off the bolthead simply by chiseling.

d. Obtain an electric drill and a high-speed steel bit to drill the head off the stubborn bolt.

13. Why are a mirror and a magnifying glass included in a tool kit such as the TK-105/G?

a. For soldering and unsoldering connections by concentration of sunlight.

b. For inspecting equipment and seeing details of work being done

c. For conserving dry cell batteries used in the inspection light

d. For deflecting and magnifying spurious light beams

14. Using Government property for its intended purpose, safeguarding it, and otherwise caring for it are what you do in carrying out your

a. supply obligation.

b. pecuniary liability.

c. property responsibility.

d. property accountability.

15. Overheard in a repair shop were the remarks given below. Pick the one which reflects the most favorable attitude toward the matter of safety.

a. "Well, I've been doing it this way for years. And I never had an accident!"

b. "I always put the guard in place before turning this on."

c. "That rule is for the birds. We don't bother. Wise up!"

d. "It's too blasted hot to wear these goggles."

16. All efforts in accident prevention should be aimed at detecting and getting rid of

a. unnecessary movement.

b. machines.

c. hazards.

d. tools.

17. A repairman near you has been troubleshooting a transmitter. One moment you see him probing the transmitter's circuit, and the next you hear a little thud and see his unconscious, limp form slumped against the transmitter. What should you do?

a. First, notify the foreman or shop supervisor; then place the victim in a prone position and press his back.

b. First, call for an ambulance; then give the victim artificial respiration by blowing into his mouth until his chest rises.

c. First retrieve the victim, being careful not to get yourself electrocuted; then place the victim on his back, with his head to one side.

d. First, retrieve the victim with care to avoid electrocuting yourself; then clear the victim's airway and begin artificial respiration at once.

18. One of the repairmen in your shop accidentally placed his hand heavily on the hot portion of his soldering iron. You observe that he got some blisters and some redness of the skin as a result. How serious is his burn likely to be?

a. First degree

b. Second degree

c. Third degree

d. Fourth degree

19. What does the emergency treatment of burns primarily consist of?

a. Prevention of infection and reduction of shock

b. Application of salt solution to the burned area

c. Application of ointment and reduction of shock

d. Puncturing of any blisters and application of compresses

20. Why should profuse bleeding be stopped as soon as possible?

a. Too much bleeding in a short time induces too much oxygen into the cardiovascular system, causing euphoria, which may be deadly.

b. Sudden loss of much blood results in arteries being crushed by pressure and contraction of the flesh.

c. Sudden loss of much blood usually causes a heart attack or a cerebral hemorrhage.

d. Sudden loss of much blood results in serious shock and often in death.

21. Using figure 17 in the attached memorandum, identify the pressure points that are BEST used for stemming arterial bleeding in the forehead, the arm, and the leg, in that order.

a. Carotid, facial, and ulnar

b. Carotid, temporal, and brachial

c. Occipital, radial, and tibial

d. Temporal, subclavian, and femoral

22. How can you determine that bleeding is from a ruptured or severed artery?

a. The blood comes out foamy and is brownish.

b. The blood oozes out slowly and sluggishly.

c. The blood comes out in spurts and is bright red.

d. The blood contains tiny particles of the blood vessel.

23. Whenever the victim of an accident coughs up blood, he is probably suffering from

a. capillary bleeding.

b. arterial bleeding.

c. internal bleeding.

d. venous bleeding.

24. What pressure point is one of several that will stem serious bleeding in the lower part of the leg?

a. Occipital

b. Temporal

c. Femoral

d. Radial

25. What does the proper treatment of minor cuts consist of?

a. Applying a tourniquet at a pressure point between the wound and the heart

b. Letting the blood flow and coagulate naturally

c. Applying an adhesive compress over the wound

d. Cleansing and protecting the wound

CHECK YOUR ANSWERS WITH LESSON SOLUTIONS ON PAGES 39 AND 40.

EXTENSION COURSE OF THE US ARMY SIGNAL SCHOOL

LESSON SOLUTIONS

SUBCOURSE 651 .....Shop Practices and Safety

All references are to the Attached Memorandum.

1. b--para 1

2. a--para 2a

3. a--para 3b

4. a--para 3d

5. c--para 3e(2)

6. b--para 3f

7. b--para 3e(3)

8. a--para 5b; fig. 5, items F and G, plus inset

9. d--para 5a(4); fig. 4, items A and B

10. d--para 5a(3), 5d(2)

11. b--para 5f(2)

12. a--para 5b

13. b--para 5h(2) and (3)

14. c--para 6

15. b--para 8b, c

16. c--para 8b, c

17. d--para 10a(2), 10b, 10c(2), 10d and e

18. b--para 11

19. a--para 11b

20. d--para 12a

21. d--para 12c; fig. 17

22. c--para 12b

23. c--para 12b(4)

24. c--para 12c(7)

25. d--para 13